

# **DURABLE SEALING CURTAIN**

## **Field of the Invention**

The field of the invention relates to a curtain that forms a seal with the frame of  
5 an opening such as a window or door as the curtain is urged across that opening. The  
curtain is durable so that it is able to withstand substantial external pressure without  
breakage.

## **Background of the Invention**

10 The use of sealed curtains is known in the prior art. Generally, a sealed curtain  
apparatus comprises a curtain and tracks along the frame of an opening such as a door or  
window. The edges of the curtain are engaged by the tracks. As the curtain is moved  
towards a position covering the opening, the edges of the curtain travel along the tracks.  
The benefit of this design is that the sealed curtain prevents matter such as insects and  
15 debris from passing through the space between the curtain and the frame. However,  
because the curtain is sealed, the apparatus becomes less durable because it cannot yield  
to external forces. With unsealed curtains, an external force applied to the curtain will  
merely briefly displace the curtain from the door or window frame. With sealed curtains,  
the engagement of the curtain edges with the tracks on the frame prevents the curtain  
20 from becoming displaced. Consequently, an external force applied to the sealed curtain  
may cause stress on the curtain leading to breakage.

In this respect, the durable sealing curtain according to the present invention  
substantially departs from the conventional concepts and designs of the prior art, and in



and thereby allow the curtain to be more easily raised or lowered, after which, the cam mechanism can be disengaged to allow the track to return to its outwardly biased position, thus returning the curtain to a taut condition.

5

### **Brief Description of the Drawings**

The invention will be better understood when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a perspective view of the preferred embodiment of the present invention.

10

FIG. 2 is a sectional view of the preferred embodiment taken along line 2-2 of FIG. 1.

FIG. 3 is the sectional view of FIG. 2 with the curtain displaced away from the plane of the opening by an external force in the direction of the arrows.

15

FIG. 4 is a sectional view of an alternate embodiment of the present invention comprising tracks on each side of the opening designed for holding two curtains.

FIG. 5 is a detailed view of an alternate embodiment of the present invention showing a cam mechanism disengaged from the track to keep the curtain taut.

FIG. 6 is a detailed view of the embodiment of FIG. 5 showing the cam mechanism engaging the track to release tension from the curtain.

20

FIG. 7 is an exploded perspective view of the embodiment of FIG. 5.

FIG. 8 is a perspective view of an alternate track comprising a diagonally-shaped slot.

FIG. 9 is a perspective view of an alternate embodiment of the present invention comprising a rod attached to each track for engaging the edge of the curtain.

FIG. 10A is a sectional view of the embodiment of FIG. 9 taken along line 10-10 of FIG. 9.

5        FIG. 10B is a sectional view of an alternate embodiment of the invention of FIG. 10A showing each hem of a multi-layered curtain located on the side of the rod opposite the opening.

FIG. 11 is a perspective view of an alternate embodiment of the present invention designed for horizontal movement of the curtain across a door frame.

10        FIG. 12 is a sectional view of the embodiment of FIG. 11 taken along line 12-12 of FIG. 11.

FIG. 13 is a sectional view of an alternate embodiment of the invention of FIG. 11 comprising sloped floor tracks above the floor plane.

## 15                    **Detailed Description of the Preferred Embodiments**

The curtain apparatus is indicated generally by the numeral 10. The curtain apparatus 10 is designed to be attached to the frame of an opening 4 such as a door or window. However, the invention does not require the use of a pre-existing frame and could be practiced whereby the invention is incorporated into a prefabricated frame. The  
20    curtain apparatus 10 has a first track 1 and a second track 2. The first track 1 is slidably attached to a first frame member 5 of the opening 4. The second track 2 is slidably attached to a second frame member 6 of the opening 4. The curtain apparatus 10 has a curtain 7. The lateral edges 11 of the curtain 7 and the lateral edges 12 of the tracks 1, 2

are each shaped to allow the curtain edges to be engaged by the lateral edges of the tracks. This engagement is preferably accomplished with U-shaped or V-shaped curtain edges 11 and track edges 12. Where the curtain edges 11 are V-shaped, the apex of the curtain edges 11 are preferably heat sealed or hemmed. However, what is important is  
5 that the curtain edges 11 and track edges 12 are sufficiently engaged to prevent the curtain 7 from detaching from either track 1, 2. The curtain edges 11 are of sufficient rigidity so that they remain engaged by the track edges 12. The engagement of the curtain edges 11 by the track edges 12 allow the curtain 7 to be slidably engaged by the tracks 1,  
2 so that the curtain 7 may be positioned at any location along the opening 4. The U-  
10 shaped or V-shaped fold in the curtain edges 11 remains present when the curtain 7 is rolled.

At any given position, the portion of the curtain 7 not covering the opening 4 is wound around a rotatable shaft 51. As the curtain 7 is urged to cover the opening 4, the shaft 51 rotates to unwind the curtain 7. As the curtain 7 is urged to uncover the opening  
15 4, the shaft 51 rotates in an opposite direction to wind the curtain 7 around the shaft 51. Rotation of the shaft 51 is preferably controlled by a driving mechanism 53, which is preferably motorized. However, the driving mechanism 53 may be manually operated and also may include a counter spring. A bracket 54 is attached to each frame member 5,  
6 to support the shaft 51. The curtain 7 has a leading edge 55 that preferably has a  
20 weighted member 56 hemmed therein.

In an alternate embodiment shown in FIGS. 9 and 10A, the tracks 1, 2 each have a rod 40 attached thereto. In this embodiment, each track 1, 2 preferably has an extension 43 at one end and a guide 44 at the opposite end. The lower end of the rod 40 is

preferably fixedly attached to the rod extension 43. The rod guide 44 has an opening therethrough for receiving the upper end of the rod 40. Each lateral edge of the curtain 7 has a hem 41 forming an elongated channel 42 for slidably receiving a rod 40. In an alternate embodiment, the curtain may be multi-layered with a single channel along each lateral edge. The use of a multi-layered curtain allows air to become trapped between the layers so that the apparatus 10 may provide greater insulation. As best shown in FIG. 10B, this multi-layered curtain design may also be practiced whereby each hem 41 is located on the side of a rod 40 opposite the opening 4. Similarly, this design may also be practiced without hems 41 whereby the multi-layered curtain is comprised of a continuous material surrounding both rods 40.

Each track 1, 2 preferably has two spring mechanisms 8 that bias the track away from the opening 4, thereby keeping the curtain 7 taut. The spring mechanisms 8 allow the tracks 1, 2 to move inwardly towards the opening 4 in the event an external force is applied to the curtain 7, thus reducing the possibility of damage to the curtain 7. The spring mechanisms are preferably placed near the opposite ends of each track 1, 2. Each spring mechanism 8 preferably comprises a first post 13 and a second post 14, each fixedly attached to a track 1, 2. The first and second posts 13, 14 are preferably screws. The first post 13 and second post 14 are preferably positioned in such a manner whereby a line intersecting both posts 13, 14 would be substantially parallel to the line dividing the frame members 5, 6 and the opening 4. Approximately equidistant from the first post 13 and the second post 14 is a connecting member 15 that connects the tracks 1, 2 to the frame members 5, 6. The connecting member 15 is preferably on the opposite side of the line intersecting the first post 13 and the second post 14 from the opening 4. A horizontal

slot 16 is cut into each track through which the connecting member 15 passes. The slot 16 allows the tracks 1, 2 to move relative to the connecting member 15 and thus relative to the frame members 5, 6. Consequently, when an external force is applied to the curtain 7, the slot 16 allows the tracks 1, 2 and curtain edges 11 to move inwardly so that the external force is not as likely to damage the curtain 7 or the seal of the edges 11. A spring 17 is preferably attached at its first end to the first post 13 and at its second end to the second post 14, therebetween engaging the connecting member 15 to bias the tracks 1, 2 away from the opening 4. The spring 17 can be a coil or any flexible, resilient member.

With no external forces applied to the apparatus, the first track 1 abuts the first frame member 5 and the second track 2 abuts the second frame member 6. As best shown in FIGS. 2-3, both tracks 1, 2 are on the same side of their respective frames 5, 6, referred to as the track side 30 of the apparatus 10. The opposite side of the apparatus 10 is the non-track side 31. As best shown in FIG. 3, if an external force is applied originating from the non-track side 31, then the edges of the track 12 are not only able to slide inwardly towards the opening 4, but are also able to separate from the frame and move in the direction of the force. This movement allows even less stress to be borne by the curtain 7 and thus less chance that the curtain 7 will fail. Preferably, the tracks 1, 2 are on the inside of the building whose door or windows are sought to be covered by the curtain 7 of the present invention, thus lessening the opportunity for the apparatus 10 to be vandalized or disabled by individuals outside of the building. In this design, external forces such as wind would always originate from the non-track side 31. While the apparatus is still able to withstand forces originating from the track side 30, the ability of the track edges 12 to separate from the frame members 5, 6 allows the apparatus to

withstand even greater forces originating from the non-track side 31. So that the track edges 12 may separate from the frame members 5, 6, the connecting member 15 is preferably a bolt where the head of the bolt prevents the tracks 1, 2 from completely detaching from the frame members 5, 6, but is not completely tightened to maintain the tracks 1, 2 flush with the frame members 5, 6, thereby allowing the tracks 1, 2 to move in the plane perpendicular to the plane of the opening 4. While such positioning of the connecting member 15 allows the track edges 12 to separate from the frame members 5, 6 upon the application of an external force, it is preferable that, in the absence of such a force, the track edges 12 abut the frame members 5, 6. Thus, as best shown in FIGS. 2-3, a compression spring 101 and a washer 102 are preferably located between the head of each connecting member 15 and its corresponding tracks 1, 2. The tension of the compression springs 101 are preferably weak enough to permit the track edges 12 to separate from the frame members 5, 6 upon the application to the apparatus 10 of an external force, yet strong enough to urge the track edges 12 to return to their original positions abutting the frame members 5, 6 upon the termination of such external force.

In an alternate embodiment shown in FIG. 4, the present invention has a track on both the first frame 5 and the second frame 6, wherein each track has at least two slightly offset substantially U-shaped track edges 12 for receiving the edges of a plurality of curtains 7. Consequently, this embodiment allows for at least two curtains 7 to be pulled across the same opening 4. Most preferably, the curtains 7 in this embodiment would be made of different materials, such as where one curtain 7 is made of mesh to allow some visibility and the other curtain 7 is opaque. Since the curtains 7 are on different track



edges 12, this embodiment allows the user to close either curtain 7, for example the mesh or opaque curtain 7 as he or she desires.

In the embodiment of the invention shown in FIGS. 5-7, the apparatus 10 has a cam plate 20. While the apparatus 10 could have a cam plate 20 on each track 1, 2 of the apparatus 10, the cam plate 20 is preferably on only one track of the apparatus 10, the description herein showing the cam plate mounted adjacent track 2. The cam plate 20 abuts at least one fixed member, in this case connecting member 15 performs the function of the fixed member, and at least one mobile member, in this case fixed post 14 performs the function of the mobile member. The fixed member 15 is attached to the frame member 6 and the mobile member 14 is attached to the track 2. The cam plate 20 has a diagonal cam surface 23 in abutment with fixed member 15.

When the cam plate 20 is activated by being urged along the track 2, the cam surface 23 engages the fixed member 15, thereby urging the cam plate 20 towards the opening 4. Since the cam plate 20 abuts mobile member 14, the urging of the cam plate 20 towards the opening 4 also causes the mobile member 14 to be urged towards the opening 4. Since the mobile member 14 is attached to the track 2, the result of the activation of the cam plate 20 is that the track 2 is urged toward the opening 4. The urging of the track 2 towards the opening 4 decreases tension on the curtain 7. Consequently, the curtain 7 is less taut and is easier to slide open or closed when the cam plate 20 has been engaged. While the cam plate 20 may be engaged through the manual manipulation of a lever 26, this embodiment may also be practiced by using an automated device where, for example, the cam plate 20 is activated while the curtain 7 is being opened or closed. Once the curtain 7 reaches a predetermined setting, a sensor detects this

positioning and the cam plate **20** is disengaged and the curtain **7** is pulled taut. The cam plate **20** preferably has a securing notch **50** adjacent to the cam surface **23**. When the cam plate **20** is activated by being urged along the track **2**, cam surface **23** slides along fixed member **15** until fixed member **15** is positioned within the securing notch **50**, best shown in FIG. 5, thereby securing the cam plate **20** as shown in FIG. 6.

While the preferred embodiment accomplishes the aforementioned camming action through a track **2** having an abutting cam plate **20**, another embodiment shown in FIG. 8 achieves a similar action without the use of a cam plate **20**. In this embodiment, the slot **21** is angled upwardly and inwardly towards the opening **4**. While such features may be present, this embodiment does not require a spring assembly **8**. This embodiment requires at least one fixed member **22** located within the slot **21**. The diagonally-shaped slot **21** described above creates the cam surface **23** described in other embodiments of this invention. A lower shelf **26** is formed on the bottom of the track **2** and is preferably substantially perpendicular to the track **2**. Using this construct, the track **2** may be urged upwardly and inwardly towards the opening **4**, causing the curtain **7** to be loosened while it is urged in either direction along the track. When the curtain **7** is lowered, the leading edge **55** will engage shelf **26** and force shelf **26** in a downward direction. Since the shelf **26** is connected to the track **2**, the track **2** is thus urged downwardly and outwardly from the opening **4**, thus tensioning the curtain **7**.

While the most common embodiment of the invention is where the curtain **7** is urged upwardly and downwardly over an opening **4** such as a door or window, FIGS. 11-13 show alternate embodiments where the curtain **7** is urged sideways over an opening **4** such as a patio door. In these embodiments, the features are substantially the same, but

rotated ninety degrees. For example, the first **1** and second tracks **2** are upper and lower tracks rather than left and right tracks as in the most common embodiment. However, the lower track will be referred to as the floor track **25** and the lower frame member as the floor frame member **24**. The first embodiment of this design, as shown in FIG. 12, has a  
5 floor track **25** below the plane separating the floor frame member **24** from the opening **4**. The second embodiment of this design, as shown in FIG. 13, has a floor track **25** mounted on top of the floor frame **24**. In this embodiment, the floor track **25** has a ramped front end **27** and back end **28**. The upper surface of the floor track **25** is substantially horizontal. The angle of the ramped front end **27** and back end **28** is  
10 preferably less than or equal to 45°, more preferably less than or equal to 35°, and even more preferably less than or equal to 25°. This allows the opening **4** to be traversed with reduced risk of serious injury from tripping over the floor track **25** due to the gentle sloping nature of the floor track **25**.

It is to be understood that the forms of the invention shown and described are  
15 preferred embodiments thereof and that various changes and modifications may be made therein without departing from the spirit of the invention or scope as defined in the following claims.